BEFORE THE PUBLIC UTILITIES COMMISSION OF THE STATE OF CALIFORNIA

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Order Instituting Rulemaking Regarding Policies, Procedures and Rules for Development of Distribution Resources Plans Pursuant to Public Utilities Code Section 769.	)	Rulemaking 14-08-013 (Filed August 14, 2014)
And Related Matters	)	Application 15-07-002 Application 15-07-003 Application 15-07-006
(NOT CONSOLIDATED)		
In the Matter of the Application of PacifiCorp (U901E) Setting Forth its Distribution Resource Plan Pursuant to Public Utilities Code Section 769.	)	Application 15-07-005 (Filed July 1, 2015)
And Related Matters	)	Application 15-07-007 Application 15-07-008

RESPONSES TO TRACK 2 DEMONSTRATION PROJECTS QUESTIONS OF SAN DIEGO GAS & ELECTRIC COMPANY (U 902-E)

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June 16, 2016

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RESPONSES TO TRACK 2 DEMONSTRATION PROJECTS QUESTIONS OF SAN DIEGO GAS & ELECTRIC COMPANY (U 902-E)

Pursuant to the *Joint Assigned Commissioner and Administrative Law Judge's Ruling Regarding Track 2 Demonstration Projects*, dated May 17, 2016 (the "ACR"), San Diego Gas & Electric Company, in Attachment 1 hereto, provides its responses to questions in the ACR.

Respectfully submitted,

/s/ Jonathan J. Newlander

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Attachment 1

Questions for DRP Revised Project Proposals

This attachment provides questions to be answered in the supplemental filing for each demonstration project. If you wish to address other issues you may do so in your response. Include detailed information supporting your project where possible.

Commission Approval

1) Should any of the demonstration projects, either as a category across all utilities or for a specific utility, be prioritized for Commission approval, or should all projects be approved at the same time? Explain the reasons. Are there specific timing considerations that should be factored?

   SDG&E Response: SDG&E believes that projects should be approved based on their readiness for deployment. No demonstration should be given specific priority over another unless it is a fully developed demonstration project. Certain projects may require input from the Commission or the DER community before their scope can be finalized. Additionally, a project may need more time for conditions to develop (i.e., high penetration levels of DERs) that will result in a true test of DER functionalities, capabilities, or impact to the distribution system.

Project C

Objectives and Methods

1) Describe the project goals and the specific functions and features of DERs the project will demonstrate. Describe how the projects will demonstrate the stated goals found in the description of the demonstration project at pages 6-7 of the Attachment to the Guidance Ruling dated February 2, 2015.

   SDG&E Response: The goal of Project C is to verify the ability of DERs to provide local benefits as calculated by the Locational Net Benefits analysis. DERs deployed to accomplish this goal may include demand response (DR), solar, and energy storage (ES). This project may utilize solar on the circuit to partially charge the energy storage device and discharge during peak hours to defer the capacity deficiency. DERs that have smart inverters have the potential to provide voltage support by absorbing or consuming reactive power to insure the feeder is within an acceptable operating range. The three avoided cost categories expected to be address as part of Project C include distribution capital and operating expenditures, resource adequacy procurement, and distribution voltage and power quality capital and operating expenditures. In order to achieve the goals of Demonstration Project C, SDG&E will perform the following tasks:
   - *Identify an optimal location within the DPA region using standard forecasting methods.*
   - *Identify which DER services are needed to avoid or defer the traditional upgrade*
   - *Construct and/or solicit the least cost best fit DER portfolio using locational factors and document the process so that lessons learned can be derived and replicated in the future.*
     1. *Once deployed, the DERs will be operated in concert with each other and with existing infrastructure to manage the functions identified in the three avoided cost categories.*
   - *Monitor and analyze the identified location before and after DER installation and operation to validate DER's performance*
     1. *Ability to avoid or defer traditional upgrades, and*
     2. *Achieve locational net benefits.*

   The project will have a final report detailing the profiles used defer the capacity project by the three avoided cost categories, specify how the load characteristics of the circuit assisted with identifying the DER profile, and the products and services employed. A detailed description of the operational characteristics will also be provided in the final report.

2) What are the specific learning objectives and how will that inform the achievement of California's DRP Goals?

   SDG&E Response: Project C will provide a platform for SDG&E to test the capability of DERs to operate during critical conditions to avoid thermal capacity deficiencies.

Utilizing DER - which can include generating technology types (PV, ES, DG) and/or certain load modifying technologies types (ES and DR) of resources - to provide the equivalent thermal capacity as would have been provided by the deferred/avoided traditional utility distribution project introduces operational challenges and SDG&E plans to gain a better understanding of if/when the DERs can or cannot be relied upon. For example, increasing the thermal capacity of a distribution circuit to meet increasing load demands creates minimal to no operational issues because the "wire's" ability to perform is based upon a "static" operational element, i.e., if the wire is capable of being energized, it will be energized. However, a "dynamic" operational element is created when certain DER technology types are used to provide the equivalent thermal capacity, e.g., a PV system is capable of operation but may be unable to operate when needed (due to lack of sun), an ES system is capable of discharge operation but may be unable to discharge when needed (due to not being adequately charged), a DR program is capable of being activated but may not be activated (due to reaching use limitations). The learnings and experience gained via this demonstration will assist in how best to further DER acquisitions to achieve the DRP Goals. The implementation of third party solutions will assist in understanding an appropriate specifications and time frames required for soliciting DERs to avoid future distribution capacity projects.

3) What specific metrics will assess the project performance?
SDG&E Response: SDG&E has not yet compiled a comprehensive list of all metrics to be used to fully evaluate the performance of the DER portfolio implemented in Project C, but provides some examples below to provide insight into some of the key metrics that are being considered. Multiple data sources will be utilized to develop specific metrics that fully assess the performance of the individual DERs as well as the entire DER portfolio. Real-time data measuring key items such as current and voltage on the circuit will be monitored to evaluate the effectiveness of the DER portfolio to provide the desired impact to the circuit. Historical data such as the number of Load Tap Changers (LTC) operations and the number of capacitor operations will be analyzed to evaluate if the smart inverters are absorbing or providing the required voltage support required on the circuit. The time-frame required to acquire and install the required DER portfolio will also be a metric as it would be compared to that of a traditional design and construction schedule for a comparable capacity project. Only from looking at a comprehensive collection of metrics such as these will we be able to fully assess the effectiveness of the DER portfolio.

Until further analysis of the circuit can be performed and potential DER solutions are fully scoped, a precise performance matrix cannot be fully defined. But, at a minimum, the third party DER will be evaluated during the demonstration to determine the

validity of the name plate rating, availability and responsiveness. As an example, performance metrics for energy storage will include the following:

Third Party DER Energy Storage Performance Metrics	
DER Real Power Output	Measure the real power (kW) output of the DER solution compared to the name plate rating.
DER Reactive Power Output	Measure the reactive power (kVAR) output of the DER solution compared to the name plate rating.
DER Energy Capacity	Measure the actual energy capacity (MWh) of the DER solution compared to the name plate rating.
DER Availability	Measure the ability of the DER solution to respond to utility request for operation.
Point of Common Coupling Voltage Support	Measure the voltage increase/decrease seen at the PCC due to the DER operation.
Turn Around Efficiency	Measure the overall energy lost (%) from the storage and utilization of energy.
DER Operational Mode Validation	Verify the DER solution modes of operation, such as peak shaving, operate as expected.

Smart devices or Intelligent Electronic Devices (IED) installed on the circuit will be evaluated further to determine the effectiveness of automated operations and possible communication issues. As an example, the performance metrics for Smart devices and IEDs will include the following:

Smart Device/IED Performance Metrics	
DER Real Power Output	Measure the real power (kW) output of the DER solution compared to the name plate rating.
DER Reactive Power Output	Measure the reactive power (kVAR) output of the DER solution compared to the name plate rating.
Communication Latency	Latency between issued command to actual operation will be measured.
Communication resiliency	Communication failures and signal loss will be measured.
Point of Common Coupling Voltage Support	Measure the voltage increase/decrease seen at the PCC due to the DER operation.
Effectiveness of proposed autonomous operations	Proposed autonomous solutions effectiveness such as automated Volt/VAR operations should be compared to simulated results.

4) What is the project's potential for replication across the system?
SDG&E Response: While no two circuits are exactly the same, lessons learned from Project C will help shape how future capacity deferrals and DER acquisitions are accomplished. These lessons will help refine the Locational Benefits Analysis and provide a model for widespread DER implementation. While SDG&E believes replication may be possible, the actual installation and operation of DERs may be challenging as past experience indicates that siting can be a challenge and that third party providers have not historically been willing to accept strict performance guarantees. The assurance that DERs operate when needed and at the required level are key for the reliability and safety of the distribution system.

Project Location

5) Identify the proposed location for the project and explain why the location was selected.
SDG&E Response: SDG&E has identified two circuits that will be used in Demonstration Project C: Circuit 701 connected to Mission substation, and Circuit 470 connected to Felicita substation. Circuit 701 was chosen due to a high number of smart inverters that are already connected to the circuit as part of an on-going pilot project. These third party owned smart inverters can be leveraged for voltage and capacity benefits. Circuit 470 was chosen to align with demonstration project B, which will also be performed on circuit 470. A future capacity project has been identified for circuit 470.

6) Identify the relevant characteristics of the location chosen for the project (e.g., rural or urban area, current load, number of customers, current DER penetration, and projections of load and DER penetration).
SDG&E Response: Circuit 701, fed from Mission Substation, is highly loaded (89% adverse forecast) and has a relatively large amount of existing rooftop solar interconnected when compared to that of a typical SDG&E feeder. As stated in the response to Question 5, circuit 701 has a high number of smart inverters, which is a characteristic not available on other circuits within SDG&E. The total solar penetration on the circuit is 3,515 kW and the profile consists of highly residential load (4,911 residential meters contributing to 84% of peak load) with an evening peak occurring from 5:30 P.M.-8:30 P.M. The table below provides a summary of the characteristics of circuit 701.

Summary of Circuit 701 Statistics	
Residential Meters	4,911 (84% of peak)
Commercial Meters	138 (16% of peak)

Forecasted 2016 Peak	533 A
Circuit Capacity	600 A
Connected kVA	18,330
Peak Time	17:30-20:30
Distributed Generation	3,515 kW 99% PV (2,099kW > 30 kW)
Service Area Size	4.15 sq Miles
Fixed Capacitors	1-1200 kVAr
Switched Capacitors	2-1200 kVAr

Circuit 470, fed from Felicita substation, has a forecasted capacity deficiency due to area load growth in addition to existing infrastructure reaching capacity under present day peak conditions. The circuit is geographically isolated as it is mainly adjacent to the highway 78 corridor and it feeds a rural community in the foothills outside the city of Escondido. Circuit 470 has 1,042 meters 192 of which are commercial and its peak load is primarily derived from commercial load (70%). The high commercial load contributes to circuit 470 being a day time peaking circuit, with peak load occurring in the late afternoon hours between 2pm and 6pm, therefore PV installations should be able to provide a greater capacity benefit compared to other DER profiles. The table below provides a summary of the characteristics of circuit 470.

Summary of Circuit 470 Statistics	
Residential Meters	850 (29% of peak)
Commercial Meters	190 (38% of peak)
Industrial Customers	2 (33% of peak)
Forecasted 2016 Peak	588 A
Circuit Capacity	600 A
Connected kVA	22,862
Peak Time	14:00-18:00
Distributed Generation	1,816 kW 100% PV (408kW > 30 kW)
Service Area Size	~15 sq Miles
Switched Capacitors	3-1200 kVAr

7) Describe any relevant demonstration projects and pilots being done outside of the DRP process (for example, with EVs and the demand response reverse auction) and the coordination issues that need to be considered.

SDG&E Response: As stated in the Question 5 response, the Circuit 701 Smart Inverter Project is an on-going pilot project. SDG&E is working in conjunction with a third party DER provider to install Smart Inverters in a neighborhood fed by Circuit 701. Demonstrations are being conducted to measure the operation of the smart inverters

as well as the impact of the smart inverters to the circuit's voltage profile. Project C must be coordinated with the Circuit 701 Smart Inverter Project to ensure the desired results are achieved and that the installation of new DERs on Circuit 701 do not unintentionally disrupt the existing, on-going study.

Furthermore, SDG&E is moving forward with an EPIC-1 project on Value Assessment of DER Grid Support Functions. The projects will determine the viability of specific DER functions and identify which, if any, grid support functions of DER in which application situations should be pursued in distribution system development. It will clarify which standards would help meet the needs of future DER integrations systems.

DER Portfolio and DER Ownership

8) If known, explain what specific DER technologies will be selected and why.

SDG&E Response: DER technologies for Project C are not fully known at this time. SDG&E plans to select some energy storage and solar with smart inverters as our DER technology. Energy storage has the capacity to reduce the loading on the feeder and maintain voltage as well as reactive power within an acceptable range.
The solar in combination with smart inverters will allow for charging of the batteries, adjust the peak for day peaking circuits and develop a platform of data to study the implications of smart inverters. With new residential solar installations eventually having smart four-quadrant inverters, the smart inverters require further testing to see if as an aggregate they will have a meaningful effect on feeder voltage and reactive power flow.

9) Described what role third-party DER technology vendors will have in the project.
SDG&E Response: For Circuit 701, third party DER developers have played a significant role in the roll-out of smart inverters with rooftop customers. SDG&E plans for third party DER developers to install similar systems for Circuit 470 as the DER profile for the project will require products and services from third party vendors. Where it is determined that additional DER resources are required for Project C, competitive solicitations will be held with third party DER technology vendors.

10) Describe DER ownership: utility, customer, and third party with appropriate justification.
SDG&E Response: SDG&E will develop proper signals to all DERs that, if responded to correctly by the DERs, will ensure circuits do not exceed their capacity or voltage limits during peak hours allowing for capacity and voltage mitigation. Third party owned DERs will be sourced via appropriate contracts. It is important for third party DERs to provide the appropriate performance guarantees to insure the product they

are providing has some reassurance to operate under all conditions. Customers will continue to own, operate and maintain their rooftop solar and smart inverters. Where third party DERs cannot be sourced with appropriate guarantees or within the required timelines, SDG&E will deploy utility owned DERs to meet the capacity and voltage needs.

Budget and Cost Recovery

11) Provide a breakdown of the project by activity (e.g., engineering, installation of field devices, modeling, data gathering, data analysis) and an estimated cost for each activity. Include the grand total for the project.
SDG&E Response: While detailed engineering and analysis has not yet been performed. SDG&E has compiled some preliminary estimates for Project C as detailed in the table below:

Task	*Description*	*Estimated Cost ($k)*
1	*Design and Engineering*	*$200*
2	*Customer acquisition*	*$750*
3	*Installation of smart inverters*	*$450*
4	*Installation of storage systems*	*$4,600*
5	*Modeling and simulations*	*$250*
6	*Data analysis and reporting*	*$150*
	Total Estimated Cost	*$6,400*

Estimates have not been provided for any third party procured DER as that cost would be determined through a competitive solicitation.

12) What other funding and/or pilots will be leveraged by deploying the project in the proposed area?
SDG&E Response: Project C will leverage the Circuit 701 Smart Inverter Project which has already installed a large number of smart inverters on Circuit 701. Future funding is planned to be allocated to Circuit 470 to mitigate the capacity deficiency.

As part of the stakeholder process to define the scope and implement each demonstration project, SDG&E plans to request authorization to open the appropriate mechanisms to track and request cost-recovery of applicable project expenses.

Schedule

13) Provide a schedule for project design and deployment. Identify major milestones for the project and a description of the activity to be performed. Include a timetable (by year and quarter) showing when each step will be completed, including when deliverables are due.
SDG&E Response:

Activity	*Duration*	*Start*	*Finish*
Approval of DRP Plan	TBD		12/1/16
Review data and identify candidate circuits	3 mo	4/1/16	6/30/16
Establish baseline operations	3 mo	12/1/16	3/31/17
Analyze circuits	3 mo	1/1/17	3/31/17
Procure equipment/ Conduct solicitations	3 mo	4/1/17	6/30/17
Install equipment in the field	18 mo	10/1/17	3/31/19
Demonstrations and data analysis	6 mo	4/1/19	9/30/19
Final report	6 mo	10/1/19	3/31/20

Deliverables and Reporting

14) Identify the deliverables that are expected during the project including their due dates.
SDG&E Response: SDG&E deliverables for this project consist of:
Circuit identified: 7/1/2016
Circuit History Operation and Forecast: 7/1/2017
Circuit Model Developed and minimum cost DER profile:7/1/2017
Circuit Model analysis with DER installed: 12/1/2017
Acquire and install minimum cost DER: 6/1/2019
Final Report of Demonstration: 4/1/2020

15) Identify a schedule and format for reporting to the Commission interim and final results.
SDG&E Response: SDG&E plans to provide annual reports to the commission specifying the project status, relevant changes or modifications to the schedule and detailing completed milestones. SDG&E will provide a final report for the demonstration by 4/2020.

Stakeholder Engagement and Collaboration With Third-Parties

16) How will stakeholder participation be coordinated in the design and implementation of the project?
SDG&E Response: As part of the scoping of Demonstration Project C, SDG&E intends to solicit stakeholder input via the LNBA working group formed for demonstration Project B. This working group will help inform the types of DER capabilities SDG&E can leverage to provide benefits to the chosen distribution circuits. Input will be gathered via email, conference calls, or webinars as appropriate.

Project D

Objectives and Methods

1) Describe the project goals and the specific functions and features of DERs the project will demonstrate. Describe how the projects will demonstrate the stated goals found in the description of the demonstration project at pages 6-7 of the Attachment to the Guidance Ruling dated February 2, 2015.

   SDG&E Response: Per the *final DRP guidance*, *the goal for Project D is to demonstrate high DER penetration that integrates distribution system operations, planning and investment for implementation. In order to operate the system at high DER penetrations, DERs must be able to regulate voltage on the distribution system without interfering with utility Volt/VAr control, and modulate output to reduce the impact of reverse flow on the distribution system.*

   The DERs deployed to accomplish this goal for high DER penetration may include energy efficiency, solar and energy storage devices, or other such DER technology as might be proposed by third party DER developers and that are able to be effectively sited in the area of Project D. This demonstration will utilize solar on the circuits to charge energy storage devices during times of high PV production & low load and to discharge energy storage devices during peak demand hours to manage the high penetration of solar PV. Smart inverters can be used to provide voltage support by absorbing or consuming reactive power to insure the circuit remains within an acceptable operating range. All DER technologies deployed in Project D will be assessed to gain a better understanding of their ability to reliably provide the right amount of both real and reactive power to the circuit at the right time and in the right place. Additional insight will be provided into the challenges of coordinating these various DER with other DER on the circuits as well as the existing utility equipment.

   A detailed report will be provided detailing how multiple DERs were constructed or sourced, the operation of multiple DERs, and additional decisions specifying why the DERs were selected. The report will also describe the operational characteristics required to achieve locational benefits of DERs at the substation level under a high penetration scenario.

2) What are the specific learning objectives and how will that inform the achievement of California's DRP Goals?
   SDG&E Response: Similar to Project C, Project D constructs a platform to develop high DER penetration covering all components of the distribution system (planning, operation and investment) is a significant learning objective as it aligns with an overarching goal for California's DRP to increase DERs throughout California. The lessons learned from this project will pave the way for defining high penetration and possibly shape distribution planning to invest in the proper tools that will prepare SDG&E for high DER penetration system wide.

3) What specific metrics will assess the project performance?

SDG&E Response: SDG&E has not yet compiled a comprehensive list of all metrics to be used to fully evaluate the performance of Project D, but we have provided some examples in our response below to provide insight into some of the key metrics we are considering. *The amount of DER penetration at the substation level will be monitored. Another metric will include how effectively the "duck" curve can be shifted or leveled. Additionally, the voltage performance of the circuits both before and after the implementation of the Project D will be closely monitored.*
Until further analysis of the substation and circuits can be performed and propose DER solutions are fully scoped, a precise performance matrix cannot be fully defined. But at a minimum the Third Party Distributed Energy Resources will be evaluated during the demonstration to determine the validity of the name plate rating, availability and responsiveness. As an example, performance metrics for energy storage will include the following:

Third Party Energy Storage DER Performance Metrics	
DER Real Power Output	Measure the real power (kW) output of the DER solution compared to the name plate rating.
DER Reactive Power Output	Measure the reactive power (kVAR) output of the DER solution compared to the name plate rating.
DER Energy Capacity	Measure the actual energy capacity (MWh) of the DER solution compared to the name plate rating.
DER Availability	Measure the ability of the DER solution to respond to utility request for operation.
Point of Common Coupling Voltage Support	Measure the voltage increase/decrease seen at the PCC due to the DER operation.
Turn Around Efficiency	Measure the overall energy lost (%) from the storage and utilization of energy.
DER Operational Mode Validation	Verify the DER solution modes of operation, such as peak shaving, operate as expected.

Smart devices or intelligent Electronic Devices (IED) installed on the circuits will be evaluated further to determine the effectiveness of automated operations and possible communication issues. As an example, the performance metrics for Smart devices and IEDs will include the following:

Smart Device/IED Performance Metrics	
DER Real Power Output	Measure the real power (kW) output of the DER solution compared to the name plate

	rating.
DER Reactive Power Output	Measure the reactive power (kVAR) output of the DER solution compared to the name plate rating.
Communication Latency	Latency between issued command to actual operation will be measured.
Communication resiliency	Communication failures and signal loss will be measured.
Point of Common Coupling Voltage Support	Measure the voltage increase/decrease seen at the PCC due to the DER operation.
Effectiveness of proposed autonomous operations	Proposed autonomous solutions effectiveness such as automated Volt/VAR operations should be compared to simulated results.

4) What is the project's potential for replication across the system?
SDG&E Response: While no two substations or circuits are exactly the same, lessons learned *from Project D will be used to help manage future high DER penetration throughout the service territory based on the results from this demonstration. As part of the project, SDG&E hopes to determine what additional investments may be required to accommodate high DER penetration system-wide.*

Project Location

5) Identify the proposed location for the project and explain why the location was selected.
SDG&E Response: The proposed location for this project is at the Valley Center substation. This substation currently has a significant amount of DERs (12,070 kW of nameplate generation) and is an ideal location for additional DERs as the substation is located in a rural area of San Diego County allowing for the acquisition of land for the installation of large energy storage devices and/or solar installations. Valley Center Substation is also a highly loaded substation (95% at peak conditions). The substation is an evening peaking, with peak loads occurring around 6 P.M.

6) Identify the relevant characteristics of the location chosen for the project (e.g., rural or urban area, current load, number of customers, current DER penetration, and projections of load and DER penetration).
SDG&E Response: The substation and its circuits mainly feed a rural area which will enable lower land costs for DERs attempting to interconnect in the area. Valley center substation feeds 4,630 meters 3,701 of which are residential. The residential load

comprises 51% of peak load. The load served by Valley Center is also geographically isolated (very few tie circuits from other substations), so any capacity upgrades generally lead to above average capacity upgrade costs therefore any capacity project deferrals are likely to have greater financial benefit for SDG&E's customer base.

7) Describe any relevant demonstration projects and pilots being done outside of the DRP process (for example, with EVs and the demand response reverse auction) and the coordination issues that need to be considered.

SDG&E Response: SDG&E currently does not have any relevant demonstration projects within the Valley Center substation service area or addressing high DER penetration.

However, SDG&E is moving forward on two EPIC projects on Distributed Control and System Operations Development. Distributed Control's objective is to demonstrate a distributed control system that fills gaps in existing systems at SDG&E and that is able to strategically interoperate the various types of actively controllable devices in the distribution system in response to dynamically changing operating conditions. System Operations Development's objective is to support continued modernization of the power system via demonstrations of improved capabilities in system operations. The project will demonstrate a systematic process for realignment of operating practices with advances in technology, software, and standards.

DER Portfolio and DER Ownership

8) If known, explain what specific DER technologies will be selected and why.
SDG&E Response: DER technologies for Project D are not fully known at this time. DER technologies deployed as part of demonstration project D may include energy storage, solar, energy efficiency and demand response. Energy storage has the capacity to absorb the high solar PV generation on the feeder to allow for an increase in solar penetration. The solar will provide an avenue to charge the energy storage devices which also assist in increasing energy storage. Promoting energy efficiency and installing energy efficient devices does not require communication or advance operation providing an ideal DER for high penetration. Using demand response during peak time as an aggregate has a measureable effect on circuit loading possibly reducing the need to discharge energy storage devices if the circuit is peaking at night. Energy efficiency and demand response requires involvement and buy-in from customers which aligns with future roll-out to achieve high penetration.

9) Described what role third-party DER technology vendors will have in the project.
SDG&E Response: SDG&E plans for third party DER technology to play a significant part in Project D as the DERs will require products and services from third party vendors. Where it is determined that additional DER resources are required for Project D, competitive solicitations will be held with third party DER technology vendors.

10) Describe DER ownership: utility, customer, and third party with appropriate justification.
SDG&E Response: SDG&E will send and receive proper signals to and from all DERs that, if responded to correctly by the DERs, will to ensure reliable operation of the distribution system. This will enable SDG&E to monitor system conditions closely to achieve high DER penetration throughout a 24 hour period without adverse impacts to the distribution system. Existing third party DERs will continue to operate in their typical fashion, as customers will continue to own, operate and maintain their rooftop solar, energy efficiency items and other DERs. Where third party DERs cannot be sourced with appropriate guarantees or within the required timelines, SDG&E will deploy utility owned DERs or equipment to maintain distribution system reliability.

Budget and Cost Recovery

11) Provide a breakdown of the project by activity (e.g., engineering, installation of field devices, modeling, data gathering, data analysis) and an estimated cost for each activity. Include the grand total for the project.
SDG&E Response: While detailed engineering and analysis has not yet been performed. SDG&E has compiled some preliminary estimates for Project D as detailed in the table below:

Task	*Description*	*Estimated Cost ($k)*
1	*Design and Engineering*	*$250*
2	*Simulations*	*$150*
3	*Data analysis and reporting*	*$200*
4	*Field installations*	*$8,500*
	Total Estimated Cost	*$9,000*

Estimates have not been provided for any third party procured DER as that cost would be determined through a competitive solicitation.

12) What other funding and/or pilots will be leveraged by deploying the project in the proposed area?
SDG&E Response: SDG&E recently installed phasor measuring units (PMUs) on a circuit being served by Valley Center substation and plan to utilize this measuring tool to evaluate the impact of DERs on system operation.

As part of the stakeholder process to define the scope and implement each demonstration project, SDG&E plans to request authorization to open the appropriate mechanisms to track and request cost-recovery of applicable project expenses.

Schedule

13) Provide a schedule for project design and deployment. Identify major milestones for the project and a description of the activity to be performed. Include a timetable (by year and quarter) showing when each step will be completed, including when deliverables are due.
SDG&E Response:

Activity	***Duration***	***Start***	***Finish***
Approval of DRP Plan	TBD		12/1/16
Review data and identify candidate circuits	3 mo	4/1/16	6/30/16
Establish baseline operations	3 mo	12/1/16	3/31/17
Circuit analysis and simulations	6 mo	1/1/17	6/30/17
Procure equipment/ Conduct solicitations	3 mo	7/1/17	9/30/17
Install equipment in the field	24 mo	10/1/17	9/30/19
Demonstrations and data analysis	6 mo	10/1/19	3/31/20
Final report	6 mo	4/1/20	9/30/20

Deliverables and Reporting

14) Identify the deliverables that are expected during the project including their due dates.
SDG&E Response: SDG&E deliverables for this project consist of:
Substation and circuits identified with justification: 7/1/2016
Substation and circuit historic Operation and Forecast: 7/1/2017
Circuit Model Developed: 7/1/2017
Circuit Model analysis with DER installed. 3/30/2018
Final Report of Demonstration: 10/1/2020

15) Identify a schedule and format for reporting to the Commission interim and final results.
SDG&E Response: SDG&E plans to provide annual reports to the commission specifying the project status, relevant changes or modifications to the schedule and detailing completed milestones. SDG&E will provide a final report for the demonstration by 10/2020

Stakeholder Engagement and Collaboration With Third Parties

16) How will stakeholder participation be coordinated in the design and implementation of the project?
SDG&E Response: As part of the scoping of Demonstration Project D, SDG&E intends to solicit stakeholder input via the LNBA working group formed for demonstration Project B. This working group will help inform the types of DER capabilities SDG&E can leverage to provide benefits to Valley Center Substation. Input will be gathered via email, conference calls, or webinars as appropriate.

Project E

Objectives and Methods

1) Describe the project goals and the specific functions and features of DERs the project will demonstrate. Describe how the projects will demonstrate the stated goals found in the description of the demonstration project at pages 6-7 of the Attachment to the Guidance Ruling dated February 2, 2015.
SDG&E Response: The goal for Project E is for SDG&E to serve as a distribution system operator of a microgrid wherein DERs serve a significant portion of the microgrid's load. For Project E, SDG&E will utilize the existing microgrid at Borrego Substation and serve as the operator for the microgrid serving the customers in Borrego Springs. A final report will detail how multiples DERs were managed as well as operated by a dedicated control system, provide further guidance explaining how the DER portfolio was constructed as well as dispatched and define the necessary operational functionalities.

2) What are the specific learning objectives and how will that inform the achievement of California's DRP Goals?

   SDG&E Response: SDG&E plans to utilize the lessons learned from Project E to develop a framework for microgrids throughout SDG&E service territory. Additional microgrids align with California's DRP goals by providing additional avenues and possibly revenue for DERs to assist with reliability.

3) What specific metrics will assess the project performance?

   SDG&E Response: SDG&E has not yet compiled a comprehensive list of all metrics to be used to fully evaluate the performance of Project E, but we have provided some examples in our response below to provide insight into some of the key metrics we are considering. SDG&E will c*ompare historic data of SAIDI and SAIFI to see the overall improvement to reliability through the use of the microgrid. Additionally, SDG&E will track the number and duration of planned outages along with the hopeful reduced impact of these outages due to the operation of the microgrid. Key metrics such as frequency and voltage will be monitored to better understand any variances in the stability of these measurements between when the system is "grid-connected" versus when it is "islanded".*

4) What is the project's potential for replication across the system?

   SDG&E Response: Cost, construction, and operational barriers have resulted in *microgrids generally only being implemented in areas that lack a practical*

redundancy solution, e.g. substations that have a single transmission interconnections, isolated customers that require redundancy. However, as solutions to these barriers become available, the applications which microgrids may be utilized to address are anticipated to increase.

Project Location

5) Identify the proposed location for the project and explain why the location was selected.
SDG&E Response: The Borrego Springs area is an ideal location for project E because it is served by a lone substation. Borrego substation is fed by a single, long, radial transmission line which has more than 5,000' in elevation change and is subject to some very extreme weather. There are no other SDG&E distribution substations nearby to provide power in a contingency scenario. When the single transmission line faults, all customers in Borrego Springs experience an outage. The existing microgrid provides enough capacity to provide power to customers in Borrego Springs. Borrego Springs has 8052 kW of connected PV installations which increases the duration of islanding time of which the microgrid is capable.

6) Identify the relevant characteristics of the location chosen for the project (e.g., rural or urban area, current load, number of customers, current DER penetration, and projections of load and DER penetration).

SDG&E Response: As stated in the response to Question 5, Borrego Substation is served by a radial transmission feed, providing an ideal situation for a microgrid. Borrego Substation feeds 2857 SDG&E meters with a 40/60 residential/commercial peak load ratio.

7) Describe any relevant demonstration projects and pilots being done outside of the DRP process (for example, with EVs and the demand response reverse auction) and the coordination issues that need to be considered.

SDG&E Response: SDG&E has been constructing the existing microgrid at Borrego Substation since 2010 with support from both the US Department of Energy (DOE) as well as the California Energy Commission (CEC). In 2015, SDG&E received another grant from the CEC to support the expansion of the existing microgrid in Borrego Springs to include some additional local, solar resources. This CEC sponsored work to expand the microgrid is currently in progress. Further evaluation is required to determine if additional modifications to the microgrid are necessary to fully meet the objectives of Project E.

DER Portfolio and DER Ownership

8) If known, explain what specific DER technologies will be selected and why.
SDG&E Response: SDG&E plans to use energy storage devices, solar and existing onsite generation. The solar and energy storage can provide power to the system with zero emission and can operate in all four quadrants which allows for reactive power management. Using the existing large solar PV system SDG&E can provide power to Borrego Springs during the day, and charge the energy storage for nighttime use.

9) Described what role third-party DER technology vendors will have in the project.
SDG&E Response: There is an existing third party *solar plant that will be available to provide power during the day as well as more than 8MW of distribution connected solar; as a result no additional DER vendors are anticipated. The communication platform to achieve a dedicated control system may require third-party acquisition.*

10) Describe DER ownership: utility, customer, and third party with appropriate justification.
SDG&E Response: SDG&E currently owns, operate and maintains an energy storage device at Borrego Substation and a third party currently owns, operate and maintains a solar plant in Borrego Springs. Both parties will continue to own, operate and maintain their associated DER.

Budget and Cost Recovery

11) Provide a breakdown of the project by activity (e.g., engineering, installation of field devices, modeling, data gathering, data analysis) and an estimated cost for each activity. Include the grand total for the project.

While detailed engineering and analysis has not yet been performed. SDG&E has compiled some preliminary estimates for Project E as detailed in the table below:

Task	*Description*	*Estimated Cost ($k)*
1	*Design and Engineering*	*$300*
2	*Data analysis and reporting*	*$200*
	Total Estimated Cost	*$500*

12) What other funding and/or pilots will be leveraged by deploying the project in the proposed area?

SDG&E Response: During the 2010-2013 timeframe, the DOE provided approximately $8M in funding and the CEC provided $2.8M in funding to help create the existing Borrego Microgrid. In 2015, the CEC committed an additional $4.7M (2015-2018) in

funding to the expansion of the Borrego Microgrid.
SDG&E has on-going capital projects for the expansion of the Borrego Microgrid as well as the implementation of the Distributed Energy Resources Management Solution (DERMS), the control system for the Borrego Microgrid and various DER.

As part of the stakeholder process to define the scope and implement each demonstration project, SDG&E plans to request authorization to open the appropriate mechanisms to track and request cost-recovery of applicable project expenses.

Schedule

13) Provide a schedule for project design and deployment. Identify major milestones for the project and a description of the activity to be performed. Include a timetable (by year and quarter) showing when each step will be completed, including when deliverables are due.
SDG&E Response:

Activity	***Duration***	***Start***	***Finish***
Approval of DRP Plan	TBD		12/1/16
Engineering analysis	3 mo	1/1/17	3/30/17
Microgrid expansion construction	18 mo	6/1/15	11/30/16
Deployment of DERMS software functionality	18 mo	10/1/15	3/30/17
Demonstrations and data analysis	12 mo	4/1/17	3/30/18
Final report	6 mo	4/1/18	9/30/18

Deliverables and Reporting

14) Identify the deliverables that are expected during the project including their due dates.
SDG&E Response: SDG&E deliverables for this project consist of:
Substation and circuit historic reliability: 7/1/2017
DERMS installation: 7/1/2017
Final Report of Demonstration: 10/1/2018

15) Identify a schedule and format for reporting to the Commission interim and final results.
SDG&E Response: SDG&E plans to provide annual reports to the commission specifying the project status, relevant changes or modifications to the schedule and detailing completed milestones. SDG&E will provide a final report for the demonstration by 10/2018.

Stakeholder Engagement and Collaboration With Third-Parties

16) How will stakeholder participation be coordinated in the design and implementation of the project?
SDG&E Response: Since the microgrid in Borrego Springs is currently installed; SDG&E believes stakeholder participation will focus on developing use cases and metrics. SDG&E intends to solicit stakeholder input via the LNBA working group formed for demonstration Project B for these use cases and metrics. Input will be gathered via email, conference calls, or webinars as appropriate

Project F

Introduction:

For both procedural and practical reasons, SDG&E shares the May 17, 2016 Ruling's conclusion that "at present, it does not appear that it is necessary to address Demonstration Project F at the workshops …"[1] When proposed nearly 12 months ago, the core issues at play in Demonstration Project F – namely, incentive structures for DER deployment, and alternatives to the current utility business model – were at best implicit and largely ancillary to the broader discussion of DER integration. In the intervening 12 months, the landscape has changed considerably from a procedural perspective. The Commission has proposed to *expressly* address these issues within the context of the IDER proceeding, and the DER incentive and business model revision aspects underlying Demonstration Project F were both included in the IDER's revised scope, and have also been the subject of an Assigned Commissioner's Ruling in that proceeding.

Moving forward with Project F in this proceeding at best duplicates issues that are now squarely within the IDER proceeding's scope. At worst, moving forward with Demonstration Project F here presumes or prejudges outcomes in the IDER proceeding. Within the context of the IDER proceeding, parties should define clear objectives regarding sourcing DERs, incentives, and/or potential changes to the utility business model. Once those objectives are clearly defined, parties can jointly scope pilot projects designed to test the identified objectives. At that time, but certainly not before, parties can make an informed decision as to whether Demonstration Project F should be pursued, modified, or scrapped entirely in favor of demonstrations that more concretely validate the identified objectives. Demonstration projects to test certain objectives can't logically front run the identification of those objectives.

SDG&E's July 1, 2015 DRP filing indicates that Demonstration Project F as optional, and was not required by the DRP's Guidance Ruling. Because of that optionality, the rapidly evolving landscape around the project's core issues, and the nearly year-long lag in considering proposed DRP pilot projects, SDG&E has not deployed internal resources to advance or substantively develop Demonstration Project F. From a practical perspective, SDG&E has not developed specifics around design or implementation of Project F; therefore, answers to the questions below are premature and theoretical at best. SDG&E continues to believe that Project F's merits are best addressed in the context of the IDER proceeding.

Should PG&E and SCE be required to implement a "Project F" similar to one proposed by SDG&E?

SDG&E Response:
No. See Introduction, above. SDG&E does not have

1) The pilot proposal says "ratepayers and shareholders equally share all savings, if any, between the cost of the identified conventional solution and the DER solution." Would a shared-savings incentive program such as that described above achieve the objective of

[1] *Joint Assigned Commissioner and Administrative Law Judge's Ruling Regarding Track 2 Demonstration Projects* at p. 3, R.14-08-013, et al, May 17, 2016.

promoting the cost-effective deployment of DERs? If not, why not?

SDG&E Response:

SDG&E does not have an opinion on the ability of the incentive program to achieve the objective of promoting the cost-effective deployment of DERs.

No. See Introduction, above.

2) SDG&E's application doesn't specify an estimated budget. Is there need for a limit on the number of projects or the amount of dollars that a utility could propose during this pilot program? If so, what should it be?

SDG&E Response:

See Introduction, above. As stated in the opening comment above, resources have not been deployed to advance optional pilot F since its filing in July 2015, in anticipation of its approval, which has not occurred. Additionally the objectives of this pilot are currently being addressed in the IDER proceeding. As a result, any specifics around design and implementation of Project F are premature and theoretical at best. In closing, SDG&E has chosen not to move forward with the optional demonstration pilot Project F.

3) Should a non-market participant stakeholder review / oversight process (such as the Procurement Review Group) be required in conjunction with this pilot?

SDG&E Response:

See Introduction, above.

4) How will SDG&E evaluate which locations are right for the projects?
    a. What requirements will be used to determine the locations?
    b. How will locations be prioritized?

SDG&E Response:

See Introduction, above.

5) What cost does SDG&E expect to incur in performing the evaluation of which locations are appropriate for project F?

SDG&E Response:

See Introduction, above.

6) How will SDG&E record/track the cost incurred by SDG&E to carry out the process of "identifying and incenting optimal location of DER solutions on the distribution grid"?

SDG&E Response:

See Introduction, above.

7) How does SDG&E plan to handle circumstances when unexpected costs in DER deployment increase above the amount budgeted, especially if construction of the

project has already started?
SDG&E Response:
See Introduction, above.

8) How will SDG&E seek cost recovery in the event the "delta" dollar amount (total cost of budgeted upgrade minus total costs of the DER incentive solution) is negative (that is, the DER incentive solution cost is greater)?
SDG&E Response:
See Introduction, above.

9) Describe how the dynamic rate(s) (for residential and small business) will be structured?
SDG&E Response:

SDG&E has not explored the structure of the dynamic rates in detail.

See Introduction, above.

10) Compare the dynamic rate to that offered under the current SDG&E's Electric Vehicle pilot.
SDG&E Response:

SDG&E has not explored the structure of the dynamic rates in detail.

See Introduction, above

11) Will SDG&E leverage funding in developing the dynamic rate for Project F from the EV pilot?
SDG&E Response:
See Introduction, above.

12) Why is this project limited to storage assets? Can PV or DR be incorporated?
SDG&E Response:
See Introduction, above.

13) How will this project be coordinated with Rule 21 in terms of fees, cost, and interconnection process?
SDG&E Response:
SDG&E has not explored the coordination with Rule 21 in detail.

See Introduction, above.